

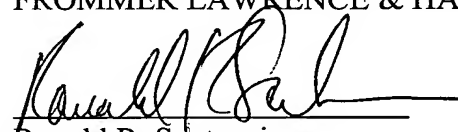
**REMARKS**

In order to conform the specification to US practice, the Applicants have added the requisite headings in the specification and included the requisite claim for priority benefits. In addition, multiple dependencies have been removed from the claims and the claims have been further amended to conform them to US practice. However, no new matter has been added. So as to clarify the changes which have been made, Applicants respectfully request that the enclosed substitute specification be accepted in lieu of the application originally filed with the International Bureau. Applicants enclose both a copy with the changes marked with underlines (for additions) and cross-outs (for deletions) as well as a clean copy which incorporates the changes. Also enclosed is an English translation of the application as originally filed with the International Bureau

The Commissioner is authorized to charge any additional fees that may be required to Deposit Account No. 50-0320.

Respectfully submitted,  
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Tool holder for flexibly deformable tool

TOOL HOLDER FOR FLEXIBLY-DEFORMABLE TOOL

5                                    FIELD OF THE INVENTION

This application is a 371 filing of PCT/IB03/01192  
filed April 2, 2003 and published October 9, 2003 under  
publication number WO 03/082387 and claims priority  
10      benefits of French Patent Application No. 02/04093  
filed April 2, 2002.

The present invention concerns a tool holder which is  
intended to receive a flexibly deformable tool. It  
15      concerns more precisely a tool holder defined according  
to the preamble of claim 1. The invention also concerns  
a device comprising such a tool holder and a flexibly  
deformable tool.

20                                    PRIOR ART

A dental syringe for intraligamentary injection is  
known from patent application FR 2 535 206. This  
syringe permits injection of product through a very  
25      fine and flexible needle into the ligaments situated  
between the jaw bone and the tooth. It is principally  
composed of an elongate body on which an injection  
control lever is articulated, a container holder  
housing a container filled with liquid to be injected,  
30      and an endpiece comprising the injection needle. In  
order to resolve problems of difficult access to the  
zones where the injections are to be given, the body of  
the syringe has an injection head which is at an angle  
to the axis of the body of the syringe. The removable  
35      needle is fitted on the body before performing the  
injections and is then withdrawn afterward. When  
fitting it in place, the needle is introduced into the  
syringe body parallel to the axis of the injection

head, undergoing a flexion movement so that its end  
positions itself parallel to the axis of the container  
holder. A conical hole serves to guide the needle  
during its introduction and provides the stresses  
5 necessary for its flexion. The angle between the axis  
of the injection head and the axis of the syringe body  
being considerable, the needle introduced into the  
injection head comes into contact with a generatrix of  
the cone, forming too great an angle with it, and  
10 buckles. To overcome this problem, a certificate of  
addition application 2 556 595 to a French patent  
provides a channel which opens out at the end of the  
injection head and into the container holder. This  
channel permits guiding of the needle from its  
15 introduction into the injection head to its emergence  
into the container holder. However, this solution has  
disadvantages. First, the diameter of the needle and  
that of the channel being substantially the same,  
introduction of the needle into the channel is  
20 difficult, or even dangerous. Cases have been reported  
where the user has been injured through faulty  
introduction of the needle. Also, at the area where the  
needle is fixed to them, the syringes have zones which  
are difficult to clean and disinfect and thus difficult  
25 to sterilize. This applies particularly to the curved  
channel, the perimeter of the cone, and the rear of the  
injection head. Finally, production of a syringe  
comprising a curved channel is complicated and,  
consequently, expensive.

30  
To overcome these problems, FR 2 785 813 discloses an  
injection syringe which, at the end of its body, has a  
channel intended to receive a needle, and with a  
conical part whose axis is parallel to the axis of the  
body and which widens toward the outside of the body.  
35 The needle is connected to an internally threaded ring  
screwed onto a threaded injection head which forms an  
angle with the axis of the body. This syringe has  
disadvantages. First, the conical part interferes with

the threaded head so that the thread is nonexistent over a portion of the head. This detracts from the quality of the connection between the body and the needle. Also, when the needle is introduced in a direction parallel to one of the generatrices of the cone, the bevel at the end of the needle risks abutting against the opposite generatrix of the cone. This poses risks of injury to the user attempting to position the needle in the channel. Finally, the needle, once it has been curved in its operating direction, bears on one of the generatrices of the conical part and as a result risks being damaged. The reasons for this is that, in view of the quality of the surface of the conical part, the needle does not lie on the totality of a generatrix, during its movement of fixation to the body, but on several points. In view of the dimensions of the needle, the pressure exerted by these points on the needle poses a risk of damaging not only its outer part, but also its channel for injection of product. Such damage necessarily has consequences on the force that has to be applied to the syringe in order to inject the product it contains.

#### SUMMARY OF THE INVENTION

The object of the invention is to make available a tool holder and a device comprising a tool holder and a flexibly deformable tool overcoming these disadvantages and improving the known devices of the prior art. In particular, the invention proposes a reliable device which can be cleaned and disinfected easily, has a simple geometry making it possible to minimize the production costs, and permitting a quality connection between the needle and the body of the tool holder, good guidance of the needle during its introduction into the body, and minimizing the risks of damage to the needle during its connection to the body.

The tool holder according to the invention is

characterized by the characterizing part of claim 1.

Claims 2 through 7 define variants of the tool holder.

- 5 The device comprising such a tool holder and a flexibly deformable tool is defined by independent claim 8.

Claims 9 through 11 define variants of the device.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Two embodiments of the invention, given as examples, are shown in the attached drawing.

- 15 Figure 1 shows an overall view of a device according to the invention, comprising a tool holder and a flexibly deformable tool.

- Figure 2 shows a diagrammatic cross section of a tool holder according to the invention, receiving a cutting tool which is flexibly deformable elastically.
- 20

- Figure 3 is a cross section of the device according to the invention, the flexibly deformable tool being shown in two positions corresponding to two stages in the method of joining it to the tool holder.
- 25

DETAILED DESCRIPTION OF THE EMBODIMENTS

- 30 The device 10 shown in figure 1 is a syringe for injecting liquids or pastes. It comprises a tool holder 1 and a lever 11 acting on a mechanism (not shown) for controlling the displacement of a thrust cylinder which causes ejection of the liquid or paste through a needle
- 35 12. It should be noted that the needle 12 can either be flexibly deformable elastically or can be flexibly deformable beyond the elastic range of the material from which it is made. The tool holder 1 comprises a body 2 in which a reservoir 6 is formed which can

directly receive the liquid or paste to be injected or a container filled with liquid or paste to be injected. At the bottom of the reservoir 6 a channel is formed which comprises a cylindrical part 3 parallel to the axis of the body 2. This channel 3 ends in a part 4 which is in the form of a divergent cone opening to the outside of the body 2 in the area of the support 5 of the injection needle 12. The support 5 is threaded, for example, and permits connection of the needle 12 to the body 2. The conical part 4 has the shape of a cone of revolution, of which one of the generatrices is substantially parallel to the axis of the cylindrical part 3 of the channel.

The needle 12 is connected to a ring 13 which, for example, has an internal thread allowing it to be joined to the support 5 of the body 2.

To assemble the needle 12 and the body 2, the needle 12 is introduced into the conical part 4. In order to ensure good penetration of the needle into the cylindrical part of the channel, the needle can in particular be pressed against the cone in the area of the generatrix parallel to the axis of the body. The needle is thus substantially parallel to the cylindrical part of the channel. The needle is then introduced into the cylindrical part 3 by means of a translational movement thereof in the axis 14 of the body 2. The needle 12 is then situated in the position shown by dotted lines in figure 3. This method of introducing the needle makes it possible to preserve its end penetrating into the body. Flexion of the needle 12 is then effected so as to bring its free end into the direction determined by the axis 15 of the support 5. The needle 12 is then situated in the position shown by solid lines in figure 3. The internally threaded ring 13 integral with the needle 12 is then screwed onto the support 5. During this action, the needle 12 penetrates a little farther into the

channel 3. Thus, the needle is joined to the body in three stages:

- 5       - a stage in which the needle is introduced into the channel,
- a stage involving flexion of the needle,
- 10     - a stage in which the needle is fixed to the body.

10

To remove the needle 12 from the body 2, the internally threaded ring 13 connected to the needle 12 is unscrewed from the support 5. As the needle 12 is no longer held in position on the support 5, it can be  
15 withdrawn from the channel by means of a translational movement thereof in the axis 14 of the body 2.

By virtue of this method of assembly, the actions comprising introduction of the needle 12 into the body  
20 2 and flexion of the needle 12 take place one after the other. They are independent and, consequently, are easier to perform.

It should be noted that the cone 4 can be replaced by  
25 any configuration ensuring that the needle can be guided toward the cylindrical part 3 of the channel by virtue of a surface whose generatrices are substantially parallel to the axis of this cylindrical part, and ensuring that the needle does not come into  
30 contact against this configuration during its stages of flexion and of fixing and when it is in its operating position.

In a second embodiment, the body 22 of the tool holder  
35 21 is applied to a drilling, milling, hammering or vibrating device intended, for example, for the field of dental surgery. The body 22 of the tool holder 21 comprises a pneumatic motor 23 or an electric motor driving a speed-reducing gear 24 or speed-increasing

gear. It can also comprise any type of transducer with which it is possible to set in motion, either directly or indirectly, the tool or the assembly consisting of the body and of the tool. The speed-reducing gear 24 or  
5 speed-increasing gear drives a spindle 25 which has an axis parallel to the body 22. The spindle 25 has a channel 32 passing through it and receiving a tool 26 which is flexibly deformable elastically, for example a drill bit or a hollow or solid milling cutter. The  
10 spindle 25 is in a pivot connection in the body 22. The tool 26 and the spindle 25 between them having a tight fit, the tool 26 is driven in rotation by friction.

The spindle ends in a divergent cone 27 opening out  
15 from the body 22 in the area of the support 28 of the tool 26. This support 28 is threaded and allows the tool 26 to be connected to the body 22. The cone 27 is a cone of revolution, of which one of the generatrices is substantially parallel to the axis of the spindle  
20 25.

The tool 26 is connected by a pivot connection to a ring 29 for guiding it. This ring has an internal thread allowing it to be joined to the support 28 of  
25 the body 22.

To assemble the tool 26 and the body 22, the tool 26 is introduced into the cone 27, then into the spindle 25 by means of a translational movement thereof along the  
30 axis 31 of the body 22. Flexion of the tool 26 is then effected in such a way as to bring its free end into the operating direction of the tool as determined by the axis 30 of the support. Finally, the internally threaded ring 29 connected to the tool 26 is screwed  
35 onto the support 28. During this action, the tool 26 penetrates a little farther into the channel 32 of the spindle 25.

To remove the tool 26 from the body, the internally



threaded ring 29 is unscrewed from the support 28. As the tool 26 is no longer held in position on the support, it returns to its initial rectilinear position by virtue of its elastic characteristics. Finally, the  
5 tool 26 is withdrawn from the spindle 25 by means of a translational movement thereof along the axis 31 of the body 22.

A variant of this second embodiment differs from said  
10 second embodiment in that the device comprises an injection needle instead of the cutting tool and in that it comprises, in place of the motor 23 and the speed-reducing gear 24, a device permitting orientation of the needle in rotation about its axis, for example  
15 alternately, thus making it possible to position the bevel of the needle with respect to the surface to be penetrated in order to perform the injection. Such a device for orientation of a needle is described for example in patent application FR 2 473 318.

20 In the two embodiments described above, the tool is fitted in the body of the tool holder by screwing. However, this can be done by any other known means, for example a bayonet-type connection or shape-fit  
25 connection. Depending on the means of fixing used, the movement of the needle with respect to the body is different during the stage in which it is fixed to the body.

Claims:

1. A tool holder (1; 21) intended to receive a  
5 flexibly deformable tool (12; 26), comprising an  
elongate body (2; 22) with a channel intended to  
receive the end of the tool (12; 26), the channel  
having a cylindrical part (3; 32) parallel to the  
10 body (2; 22) and a part (4; 27) opening to the  
outside of the body (2; 22), widening toward the  
outside of the body (2; 22) and guiding the tool  
(12; 26) toward the cylindrical part (3; 32) when  
it is being fitted in the tool holder (1; 21), and  
15 means (5, 13; 28, 29) which keep the tool (12; 26)  
in position and are arranged in such a way that  
the axis of the tool (12; 26) in the operating  
phase is not parallel to the axis of the body (2;  
22), the part (4; 27) which opens to the outside  
20 of the body (2; 22) permitting introduction of the  
tool (12; 26) into the body (2; 22) by a  
displacement of the tool (12; 26) along the axis  
of the cylindrical part (3; 32) of the channel,  
~~characterized in that~~ wherein the part (4; 27)  
25 opening to the outside of the body comprises a  
surface whose generatrices are substantially  
parallel to the axis of the cylindrical part of  
the channel and which extends from the cylindrical  
part (3; 32) to outside of the body.
- 30 2. The tool holder as claimed in claim 1, wherein  
~~characterized in that~~ the part (4; 27) opening to  
the outside of the body has configurations  
allowing it to avoid contact with the tool during  
its stages of flexion and fixation and when said  
35 tool is in the operating position.
3. The tool holder as claimed in ~~either one of the~~  
~~preceding claims~~ claim 1, wherein ~~characterized in~~  
~~that~~ the means (5, 13; 28, 29) for holding the

tool (12; 26) in position comprise, on the body (2; 22), a threaded end (5; 28) onto which an internally threaded ring (13; 29) connected to the tool (12; 26) is screwed.

5

4. The tool holder as claimed in ~~either one of claims 1 and 2~~, wherein ~~characterized in that~~ the means for holding the tool (12; 26) in position comprise, on the body, an end which cooperates with a ring connected to the tool (12; 26) in order to form a bayonet-type connection system.

10

5. The tool holder as claimed in ~~either one of claims 1 and 2~~, wherein ~~characterized in that~~ the means for holding the tool (12; 26) in position comprise, on the body, clip means which cooperate with complementary clip means on a ring connected to the tool (12; 26).

15

6. The tool holder as claimed in ~~either one of claims 1 and 2~~, wherein ~~characterized in that~~ the means for holding the tool (12; 26) in position comprise, on the body, shape-fit means which cooperate with complementary shape-fit means on a ring connected to the tool (12; 26).

20

25

7. The tool holder as claimed in ~~any one of claims 1 through 6~~, wherein ~~characterized in that~~, in the area of the cylindrical part of the channel (3; 32), it has means (25) for guiding the tool (26) in rotation.

30

8. A device comprising the tool holder (1; 21) as claimed in ~~one of claims 1 through 7~~ and a flexibly deformable tool (12; 26) connected to a ring (13; 29).

35

9. The device as claimed in claim 8, wherein ~~characterized in that~~ the tool (12; 26) is

connected to the ring (29) by a pivot connection.

10. The device as claimed in ~~either of claims 8 and 9,~~  
5        wherein ~~characterized in that~~ the tool (12) is an  
injection needle.

11. The device as claimed in claim 9, wherein  
10        ~~characterized in that~~ the tool holder (21) has  
means (23, 24, 25) for driving the tool (26) in  
rotation.

Abstract :

The invention relates to a tool holder (1) which is intended to receive a flexibly-deformable tool (12),  
5 such as an injection needle or a cutting tool. The operating direction (15) of the tool is not parallel to the axis (14) of the tool holder (1). The inventive tool holder (1) is characterised in that it ends in a part (4) of a channel that opens out onto the outside  
10 of the body (2) of the tool holder, comprising a surface having generatrices that are essentially parallel to the axis of the body and enabling the tool (12) to be introduced by moving same in relation to the axis (14) of the body of the tool holder. Said tool  
15 holder (1) comprises forms that enable the safe introduction of the needle, simple cleaning, inexpensive manufacture and a quality connection between the needle and the body.